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Weather and the Quality of Cheese

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Data concerning cheese quality was made available by the National Association of Creamery Proprietors and Wholesale Dairymen. The cheese, both film wrapped and conventional, was placed in four grades. Variation of the percentages falling into the two lowest grades gave some indication of the changes of quality over 8 years on a monthly basis. The time lag, milk to cheese grading was some 4-8 weeks. The records for the two main cheeses, Cheshire and Cheddar were examined in relation to weather in Cheshire and Somerset.

The first approach was to take the occasions when there was a rapid change in the percentages of the lowest grade cheese from one month to the next, and the weather over the preceding 3 months was examined to see if any outstanding features were recognisable.

The results (for Cheddar Cheese) are given in Appendix 1. No firm conclusions could be drawn; on most occasions the preceding weather was self-contradictory. Occasionally some consistency could be observed within the 8 year sample, but in every case check with the gradings in Cheshire cheese discounted any possible hypothesis.

The second approach was to consider the changes in quality which followed unusually warm, cold, wet, dry, sunny or dull months. The results are shown in Appendix 2. On most occasions the unusual weather was followed by an almost equal number of up or down gradings during the following 1, 2 or 3 months. On the few occasions when there was some imbalance, it was found that the largest changes often occurred in the minority grouping. Furthermore Cheshire and Cheddar behaviour was sometimes contradictory (as discovered in the first approach).

Thirdly contingency tables were drawn up showing the changes (2 months later) following months which were warm and wet, warm and dry, cold and wet, cold and dry etc. No consistent behaviour was observable except that for Cheshire cheese, a warm dry October was followed by marked improvements by December. Examination of the Cheddar records showed that following the very warm and dry October of 1969 there was the largest deterioration in quality by December.

A similar contradiction was found when considering quarterly mean quality ratings. The change from the second quarter to the third quarter in Cheshire cheese appeared to be in harmony with June rainfall, dry weather being associated with an improvement. In Cheddar the wettest June (1966) was the year of the most marked improvement in quality, and the worst deterioration (in 1969) was the year of moderate June rainfall.

/Conclusions

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Conclusions

No consistent link between cheese quality and monthly weather could be established.

Any comments or suggestions on this paper should be referred to the Author.

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APPENDIX I

CHEDDAR CHEESE (a) Sudden deteriorations in quality

Period - May to June

Increase in poor gradings:-	1969	1964	1963	1967	1968	1966	1962	1965
	+5.3	-0.1	-0.4	-1.2	-1.3	-1.6	-1.9	-3.5

If weather is the main factor, there should be some outstanding feature in 1969.

May 1969 was wet, but 1967 was wetter.
March-May rainfall was the highest of the 8 years, but weather of this type in Cheshire was followed by improved quality.
March was cold, but 1962 was colder.
April and May were relatively mild, but 1965 was almost exactly similar.
End of May soil moisture deficit was low, but so were 1967 and 1968.
End of April soil moisture deficit was relatively high, but so were 1967 and 1965.
April was very sunny, but 1962 and 1965 were not greatly inferior.

The only suggestion here is that individual days in April might be significant.

Period June to July

Increase in poor gradings:-	1968	1967	1965	1962	1963	1966	1964	1969
	+4.0	+1.2	+0.4	+0.2	+0.2	-0.1	-0.3	-1.8

April to June was wet, but 1963 was similar and 1966 was much wetter.
May was cold, but 1962 was similar.
End of May soil moisture deficit was low and so was 1967, but 1969 was similar and 1964 and 1966 not greatly different.
End of June deficit was in the 'full growth' range, but so were 1964 and 1966.
May and June were lacking in sunshine, but 1964 was duller.
June 1969 was very sunny, but the improvement in quality may be connected with the very large deterioration the previous month.

Period July to August

Increase in poor gradings:-	1965	1968	1963	1962	1969	1964	1967	1966
	+4.6	+3.0	+2.9	+0.6	+0.6	-0.1	-0.5	-0.6

July 1965 and 1968 were wet, but so was 1969, and 1963 (akin to 1968) had only moderate rainfall.
July 1965 was very cool and dull.
July 1965 and 1968 has 'full growth' conditions for grass, but so had 1966.

This suggests that cool wet July weather might be significant; but there were three cool wet July's in Cheshire, when the changes (July to August) were -1.4, +0.9 and -2.1.

Period August to September

Increase in poor gradings:-	1968	1967	1965	1964	1966	1962	1969	1963
	+4.6	+3.2	+1.6	+0.6	+0.6	-0.7	-2.0	-3.1

/August

August in each of the four 'best' years, 1966, 1962, 1969 and 1963, was wet; in 1962 and 1963 both July and August were cool, August was in both cases dull.
Cool wet weather has thus the apparent reverse effect of a cool wet July (see above), which suggests that in neither case was it the relevant factor.
In 1968 August was dull and July was wet, but the same weather occurred in 1969.

Period November to December

Increase in poor gradings:-	1969	1962	1963	1964	1968	1966	1967	1965
	+5.6	0.0	-0.4	-0.4	-1.1	-1.4	-3.2	-4.1

November was wet, but so was 1963.
October was dry, but so was 1965.
Return to soil moisture capacity was early November, but so was 1963; earlier returns had occurred in 1968, 1966 and 1967; all followed by quality improvements.
October was very mild, but so was 1968

Period February to March

Increase in poor gradings:-	1964	1965	1963	1967	1962	1966	1968	1969	1970
	+4.2	+1.9	+1.5	+1.0	+0.9	-1.1	-2.5	-4.4	-6.2

The winter (Dec.-Feb.) of 1963-4 was outstandingly dry; winters 1964-5, 1963-4 and 1967-8 were on the dry side; those of 1968-9 and 1969-70 were the wettest of the series.
No influence of temperature can be recognised.
There is no sign of any rainfall effect in Cheshire, where the Dec.-Feb. Rainfall was 8.72 in. before the biggest improvement and 8.83 in. before the biggest deterioration.

(b) Sudden improvements in quality

Period December to January

In 1968-69, there was a decrease of poor grades of 5.9. Nothing outstanding in either temperature of rainfall could be found in the October-December period. The return to capacity in 1968 was early (in late September).

Period February to March

This is discussed earlier. There was an improvement of 6.2 in 1970; the rainfall December to February was the highest of the series.

Period October to November

The improvement in 1964 of 4.6 followed the driest September and August, but the second greatest improvement in Cheshire (5.6 in 1965) followed the wettest September and August.

Period November to December

The improvement in 1965 of 4.1 followed a dry October and September, but the same period in 1969 was drier and the November to December deterioration was 5.6.

CHANGES IN PERCENTAGE OF CHEESE PLACED IN TWO LOWEST GRADES

Following warm months

Change after	1 month				2 months				3 months			
	Summer		Winter		Summer		Winter		Summer		Winter	
No. of occasions	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
CHESHIRE	1	0	1	3	0	1	2	2	0	1	2	2
Mean	+0.6			-2.7		-0.5		-2.3		-0.1		-2.0
CHEDDAR	0	0	2	2	0	0	2	2	0	0	2	2
Mean			+0.3				+1.2					0.0
TOTAL	1	0	3	5	0	1	4	4	0	1	4	4
Mean	+0.6			-1.2		-0.5		-0.6		-0.1		-1.0

Following cold months

CHESHIRE	2	4	6	5	3	3	6	6	1	3	4	8
Mean		-0.3		-0.1		-0.3	+0.3			-1.0	+0.1	
CHEDDAR	2	2	4	9	2	2	4	9	2	2	7	7
Mean	+0.1			-1.1	+0.9			-0.8	+0.8		+0.5	
TOTAL	4	6	10	14	5	5	10	15	3	5	11	15
Mean		-0.2		-0.6	+0.2			-0.3		-0.3	+0.3	

Following wet months

CHESHIRE	4	4	4	1	1	7	2	3	2	4	3	2
Mean	+0.5		+0.4			-1.0	+0.9			-1.5	+1.0	
CHEDDAR	2	6	2	5	2	5	3	4	3	5	2	5
Mean		0.0		-0.3	+0.5			-1.4	+1.1			-1.5
TOTAL	6	10	6	6	3	12	5	7	5	9	5	7
Mean	+0.2		0.0			-0.2		-0.4		-0.2		-0.5

Following dry months

CHESHIRE	0	0	3	3	0	0	2	4	0	0	2	3
Mean				-1.1				-1.0				-0.1
CHEDDAR	3	3	6	1	2	4	4	2	3	3	5	2
Mean		0.0	+1.4				+1.7				+2.2	
TOTAL	3	3	10	4	2	4	6	6	3	3	7	5
Mean		0.0	+0.3			-0.2	+0.4		+0.3		+1.1	

Following sunny months

CHESHIRE	3	5			4	4			5	3		
Mean	+0.3				+0.3				+1.5			
CHEDDAR	5	3			4	4			3	5		
Mean	+0.1				+0.7					-0.1		
TOTAL	8	8			8	8			8	8		
Mean	+0.2				+0.5				+0.7			

Following dull months

CHESHIRE	3	3			3	3			1	5		
Mean	+0.4					-0.4				-1.2		
CHEDDAR	4	2			4	2			5	1		
Mean	+2.0				+1.5				+2.4			
TOTAL	7	5			7	5			6	6		
Mean	+1.2				+0.6				+0.6			